CLAIMS

1. An electromagnetic coupler, in particular for a motor vehicle, comprising:
- a first electric machine comprising a first stator (50) having an axis A bearing at least one first coil (52) wound on a first fixed yoke (60), and capable of being coupled by magnetic induction with a first part (23; 157) of an output rotor (30) mobile rotation-wise about the axis A relative to said first stator (50), said coupling being provided via an inner drum (72), mobile rotation-wise about the axis A relative to said first stator (50) and to said first part (23; 157) and spaced apart from said first part (23; 157) and from said first yoke (60) by a first air gap (98) and an additional air gap, respectively,
- a second electric machine having an axis A comprising a second stator (40) bearing at least one second coil (100) wound on a "second yoke" (43; 164) in the form of a second magnetic circuit (43) or of a yoke (164), and capable of being coupled by magnetic induction with a second part (44; 177) of said output rotor (30) via a second air gap (106),
- an electronic unit (34) capable of supplying alternating current to said first coil (52)

said coupler being characterized in that said first coil (52) is wound on said first yoke (60) about said axis A of said first stator (50).

2. The electromagnetic coupler as claimed in claim 1, characterized in that said first yoke (60) is roughly annular having an axis A and has a "U"-shaped transverse cross section, the first (62) and second (64) flanges of said first yoke (60) being terminated by first (66) and second

(68) surfaces spaced apart from said inner drum (72) by said additional air gap (54).

3. The electromagnetic coupler as claimed in either of claims 1 and 2, characterized in that said second coil (162), annular, is wound about the axis A.

4. The electromagnetic coupler as claimed in claim 3, characterized in that said second yoke (164) is roughly annular having an axis A and presents a U-shaped transverse cross section in which the first and second flanges have a regularly crenellated profile.

5. The electromagnetic coupler as claimed in claim 4, characterized in that said second part (177) of said output rotor (30) comprises an outer crown (177) of magnetic studs (178), in line with and spaced apart from first (168) and second (170) flanges of said second yoke (164) by said second air gap (98).

6. The electromagnetic coupler as claimed in claim 3, characterized in that said second yoke (164) is roughly annular having an axis A and presents a U-shaped transverse cross section, the first and second flanges of said second yoke (164) being extended by first and second sets of prongs, respectively, disposed alternately, without contact with each other, in line with and spaced apart from said second part of said output rotor (30) by said second air gap (106).

7. The electromagnetic coupler as claimed in any one of the preceding claims, characterized in that said second part of said output rotor (30) comprises a crown (44) of outer magnets (45) in

line with and spaced apart from said second yoke (43) by said second air gap (106).

8. The electromagnetic coupler as claimed in any one of the preceding claims, characterized in that said input (20) and output (30) rotors are inserted into each other.

9. The electromagnetic coupler as claimed in any one of the preceding claims, characterized in that said input rotor (20) is at least partly covered by a binding band (90) made of a magnetic material of type Fe-17.5Cr-0.5C.

10. The electromagnetic coupler as claimed in claim 9, characterized in that said binding band (90) is produced by edge rolling a sheared strip of said magnetic material or by flat spiral winding a sheet of said magnetic material, the turns of said winding being electrically insulated from each other.

11. The electromagnetic coupler as claimed in any one of the preceding claims, characterized in that it comprises first (G1) and second (G2) adjacent wafers, each comprising at least one first coil wound, about the axis A, on a first fixed yoke, said first yokes of first (G1) and second (G2) wafers being separated by a magnetic decoupling space.

12. The electromagnetic coupler as claimed in any one of the preceding claims, characterized in that it comprises first (G1) and second (G2) adjacent wafers, and in that said output rotor (30) comprises a magnetic decoupling space disposed between said first (G1) and second (G2) wafers, in a plane roughly perpendicular to the axis A.

13. The electromagnetic coupler as claimed in either of claims 11 and 12, characterized in that a cooling circuit is disposed in said decoupling space.

14. The electromagnetic coupler as claimed in any one of claims 2 to 13, characterized in that said inner drum (72) comprises first (74) and second (76) coaxial plates of axis A, drilled in their centers by first and second holes (80) bounded by first (82) and second (83) inner surfaces, respectively, and bearing first and second sets of prongs (78, 84) extending around the periphery of said first (74) and second (76) plates, respectively, said first (74) and second (76) plates being modeled and arranged relative to each other so that the prongs of said first (74) and second (76) plates are disposed alternately, without contact between each other, in line with and spaced apart from said first part (23) of said output rotor (30), said first (82) and second (83) inner surfaces being in line with and spaced apart from said first (62) and second (64) flanges of said first yoke (60), respectively.

15. The electromagnetic coupler as claimed in claim 14, characterized in that said first part (23) of said output rotor (30) comprises a crown of inner magnets (24), radially magnetized, with alternate polarities, and disposed in line with and spaced apart from said prongs.

16. The electromagnetic coupler as claimed in either of claims 14 and 15, claim 17 being applied, characterized in that the number of said outer magnets (45) is equal to the number of said inner magnets (24), said outer (45) and inner (24) magnets being disposed with the same direction of magnetization.

17. The electromagnetic coupler as claimed in either of claims 14 and 15, claim 9 being applied, characterized in that said binding band (90) presents, above an area separating two so-called adjacent prongs, an electromagnetic permeability less than that which it presents above said adjacent prongs.

18. The electromagnetic coupler as claimed in any one of claims 14 to 17, characterized in that said first yoke (60) and/or said first plate (74) and/or said second plate (76) are made of a composite magnetic material of the "iron powder" type, or "Soft Magnetic Composites".

19. The electromagnetic coupler as claimed in any one of claims 2 to 13, characterized in that said inner drum (72) comprises first (150) and second (152) toothed crowns, coaxial with axis A, drilled in their centers by first and second holes bounded by first (150') and second (152') inner surfaces, respectively, and bearing first and second sets of teeth, respectively, said first (150) and second (152) toothed crowns being modeled and arranged relative to each other so that the teeth of said first and second toothed crowns are disposed in line with and spaced apart from said first part (72) of said output rotor (30), said first (150') and second (152') inner surfaces being in line with and spaced apart from said first (62) and second (64) flanges of said first yoke (60), respectively.

20. The electromagnetic coupler as claimed in claim 19, characterized in that said first part (72) of said output rotor (30) comprises an inner crown (157) of magnetic studs (158) in line with and spaced apart from said teeth.

21. The electromagnetic coupler as claimed in either of claims 19 and 20, characterized in that said inner crown (157) comprises as many magnetic studs (158) as said first toothed crown (150) or said second toothed crown (152) has teeth.

22. The electromagnetic coupler as claimed in any one of claims 19 to 21, characterized in that said magnetic studs (158) extend axially so as to be able to simultaneously cover, at least partly, a tooth of each of said first (150) and second (152) toothed crowns.